Climate-Smart Cities: A corporate takeover of urban environmental governance?

1. Introduction

In January 2016, a project group gathered for a meeting at the offices of the City of Malmö Environmental Department. The group consisted of representatives from the City Planning Office, the Property Department, the Transportation Department and the Environmental Department—the latter being represented by three employees at this meeting. Also represented were two important infrastructure companies: VA Syd, the municipally owned water and waste company, and Eon, the multinational energy company that owns the city's electricity and district heating networks. What brought them together every month was a vision called the Climate Contract for Hyllie, signed five years earlier. Hyllie was a new city district that would become home to thousands of new apartments. The Climate Contract was supposed to cement Malmö's international reputation as a sustainable city by making Hyllie into a 'climate-smart' city district.

Oscar and Patricia both had updates about wind turbines, a matter that the project group had been discussing all autumn. Oscar was Eon's project manager for all things related to Hyllie and the Climate Contract. Eon had promised to build wind turbines for Hyllie but the company was struggling to make these turbines a reality. The company had a plot of land located near Hyllie around the Petersborg highway interchange, but the county government had recently overturned Eon's building permit. He explained that the company had submitted an appeal. Patricia, from the City Planning Office, went on to describe the city administration's response. The director of the City Planning Office would book a meeting with the county government to discuss the rules for building urban

wind turbines. The city's comprehensive plan identified similar sites along the highway as suitable for wind turbines, but it seemed that the county government had a different opinion.

Wind turbines were central to the realisation of the Climate Contract, whose proponents envisioned in 2011 that Hyllie would become "the most climate-smart city district" in the Malmö–Copenhagen region and that the district would “lead the way for Malmö’s future development as sustainable city.”[1] The Climate Contract stated that 100% of the energy used in Hyllie should come from renewable or recycled sources by 2020. Without the promised wind turbines, there would be a lack of renewable electricity to match the increasing electricity consumption of the growing city district. For the project group, wind turbines were an important problem that lacked a credible solution.

Oscar had more news to bring up at the meeting. He first explained that January marked the formal split of Eon into two separate companies. While Eon remained the owner and operator of Malmö's electricity and district heating networks, it spun off most of its fossil fuel, nuclear and hydroelectric power business into a company called Uniper. In relation to the Climate Contract, he explained that the corporate split meant that the project group would lose access to some of the company's communications department. His second news item also had to do with the split, albeit in more symbolic terms. He had good news about the smart grid demonstration project that Eon was operating in Hyllie. Smart grids were a collection of new technologies that Eon was testing. These technologies were definitely not being spun off into Uniper. They were part of Eon's new profile as a sustainable energy company.

He also had good news to tell the project group. First, he pointed out that the project had recently paid out a record amount of funding to property developers, a sign Eon had finally been able to get developers interested in smart grid technologies. Second, he described how the Swedish Energy

[1] City of Malmö, Eon and VA Syd, 2002. *Climate Contract for Hyllie*, p. 2.

Agency had extended the demonstration project so that Eon could test its new technologies in other parts of the city. Finally, he described the intensive work to prepare an application for a follow-up project, based on several workshops with city departments. All his good news was a stark contrast to the project group's struggles with wind turbines and renewable electricity.

The Climate Contract was not the first ambitious sustainability vision for a new city district that struggled to achieve its goals. And the City of Malmö was not unique in seeking the collaboration of the for-profit energy utility that owns the city's energy infrastructure. But in Malmö, as in other cities around the world, realising such visions is a difficult endeavour. This chapter discusses the challenges of making good on the promise of a 'climate-smart' city district. The challenge arises not only making a shift from sustainable to climate-*smart*, but also from doing so in collaboration with a for-profit energy utility. How can a city government go from sustainable to climate-smart without falling victim to a corporate takeover?

This chapter continues with a section that provides some background about the notion of smart cities. Section 3 then traces the history of the Climate Contract back to the City of Malmö's efforts to recover from an economic downtown. Section 4 follows the troubled pursuit of the Climate Contract's renewable energy goals. Section 5 follows the parallel efforts to demonstrate smart grids in Hyllie. The chapter concludes with a discussion about the hopes and challenges of climate-smart cities.

2. Why is sustainability getting smart?

The spread of smart city ideas within urban environmental governance reflects a broader societal trend. Along with the popularity of smart phones, smart watches, and even smart refrigerators, there is more and more interest in *smart cities*. But the spread of these ideas is not simply a matter of city governments bureaucrats picking up the latest buzzword. While smart city ideas are certainly

popular in policy circles at many levels, their introduction in urban environmental governance is encouraged in part by corporations in the business of urban infrastructure. So along with the introduction of new ideas, smart city ideas might be accompanied by a shift in responsibility that represents a dilemma for city governments.

There are two reasons for this corporate interest in smart urban infrastructure. One reason has to do with the business models of multinational technology companies. Companies such as IBM and Cisco introduced smart city ideas as they began to invest more in technologies that could be used in urban governance and urban infrastructure.[2] But another reason is a situation in urban environmental governance that some researchers characterise as a paradox: city governments find themselves increasingly responsible for environmental issues but lack the authority and resources to make urban infrastructure more sustainable.[3] In many western countries, the liberalisation and privatisation of energy utilities has left this infrastructure in the hands of for-profit corporations. While these corporations are subject to regulations, the regulatory authority belongs to higher levels of government, so city governments that want to influence their local energy systems are forced to turn to other modes of governance. For example, city governments establish visions and negotiate with for-profit energy utilities, which requires a give and take. In terms of smart cities, a pertinent question is who benefits from this give and take. Does it result in good public policy or a corporate takeover?

Some reasons for concern have been discussed in a strand of social science research that has been critical of the increasing popularity of smart city ideas. Four reasons are relevant to keep in mind in

[2] For several examples of corporate interest in smart city technologies, see Paroutis, S., Bennett, M., & Heracleous, L. (2014). A strategic view on smart city technology: The case of IBM Smarter Cities during a recession. *Technological Forecasting and Social Change*, 89, 262–272. https://doi.org/10.1016/j.techfore.2013.08.041

[3] For more on this topic, refer to: Hodson, M., Marvin, S., & Bulkeley, H. (2013). The Intermediary Organisation of Low Carbon Cities: A Comparative Analysis of Transitions in Greater London and Greater Manchester. *Urban Studies*, 50(7), 1403–1422. https://doi.org/10.1177/0042098013480967

the case of Hyllie. First, some researchers warn of increasing corporate influence over city governments, particularly in cases where city governments might become locked in to the services of a particular company.[4] Second, others ask whether the popularity of smart city ideas might unduly prioritise problems that can be solved by smart technologies, at the expense of matters such as poverty or basic infrastructure.[5] Third, many smart city technologies involve data collection that increases the amount of surveillance in society.[6] Fourth, adding information technology to urban infrastructure might result in "buggy, brittle and hackable cities."[7] It is worth nothing that the question of increasing corporate influence is implicated in the rest of the concerns. Should corporate influence increase, city governments might lose their ability to temper other risks. The challenge for city governments, and in particular planners and other practitioners, is to prevent these collaborations from slipping away into the hands of the corporate partners.

The analysis below is based on empirical work done over several years as part of my PhD thesis.[8] It is based on a combination of interviews with employees involved in the Climate Contract, participant-observation of meetings including the abovementioned project group, and a variety of documents related to the Climate Contract. The interviews and participant-observation took place between 2014 and 2016, which made it possible to follow many developments as they happened, though the story of how the Climate Contract originated is based on interviews and documents. (This chapter uses pseudonyms to refer to the interview respondents.) This research was based on a socio-material perspective, which gives attention not just to people and organisations but also changes to

[4] Viitanen, J., & Kingston, R. (2014). Smart Cities and Green Growth: Outsourcing Democratic and Environmental Resilience to the Global Technology Sector. *Environment and Planning A*, 46(4), 803–819. https://doi.org/10.1068/a46242

[5] Söderström, O., Paasche, T., & Klauser, F. (2014). Smart cities as corporate storytelling. *City*, 18(3), 307–320. https://doi.org/10.1080/13604813.2014.906716

[6] Galdon-Clavell, G. (2013). (Not so) smart cities?: The drivers, impact and risks of surveillance-enabled smart environments. *Science and Public Policy*, 40(6), 717–723. https://doi.org/10.1093/scipol/sct070

[7] Kitchin, R. (2014). The real-time city? Big data and smart urbanism. *GeoJournal*, 79(1), 1–14. https://doi.org/10.1007/s10708-013-9516-8

[8] More details about the study are found in the PhD thesis: Parks, D. (2018). *The Sustainable City Becomes Climate-Smart : How Smart City Ideas Reshape Urban Environmental Governance*. Linköping University. https://doi.org/10.3384/diss.diva-147310

the material world such as buildings and urban infrastructure. The research perspective also prioritises how smart city ideas are used in practice and it attempts to be impartial about the positive or negative influence of companies and technologies.[9]

3. From sustainable to climate-smart in Malmö

The Climate Contract's vision of a climate-smart city district was a progression of the city government's earlier sustainability ambitions. Malmö's reputation as a sustainable city dates back to a housing exhibition that the city government organised in 2001. The housing exhibition was one part of the city government's efforts to transform the city, which had suffered economically from the shutdown of a shipyard and loss of manufacturing jobs in the 1980s and 1990s. Called Bo01, it was the first step of transforming the old shipyards into a city district called the Western Harbour, which eventually became home to over 4000 apartments and a new university. (See Figure 1 for a map of Malmö.) City planners and developers in the Bo01 neighbourhood agreed to a quality programme that, among other goals, would "ensure that the neighbourhood's environmental profile is of high quality so that it becomes an internationally leading example of how environmental accommodation of densely built areas can act as a motor in Malmö's transition to environmental sustainability."[10] Even as the research behind this chapter was undertaken around 2015, the Western Harbour continued to attract study visits from people and organisations interested in sustainable urban development.

[9] Two papers of particular inspiration for the theoretical perspective are:
Farías, I. (2010). Decentering the object of urban studies. In T. Bender & I. Farías (Red.), *Urban assemblages: how actor-network theory changes urban studies* (s. 1–24). London; New York: Routledge.
Blok, A. (2013). Urban Green Assemblages: An ANT View on Sustainable City Building Projects. *Science & Technology Studies*, 26(1), 5–24.
[10] City of Malmö, 2002. *Quality Programme for Spatial Plan 4537*, p. 5.

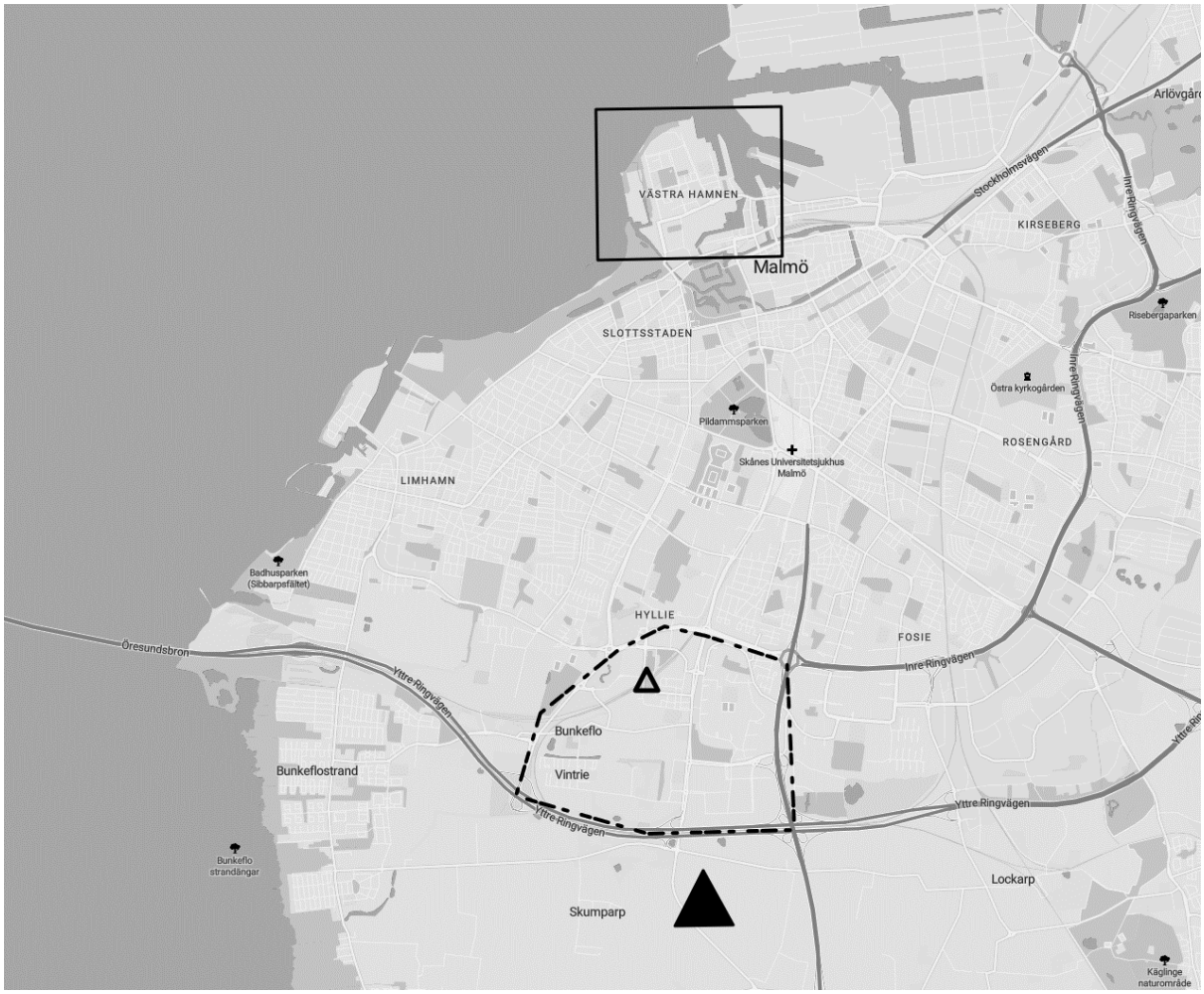

Figure 1: Map of Malmö with the Western Harbour (solid rectangle), Hyllie (dotted line), Hyllie station (unfilled triangle) and the proposed location of Eon's wind turbine (solid triangle). The west side of the map shows the Öresund Bridge toward Copenhagen. Map data © OpenStreetMap contributors, under ODbL. Tiles courtesy of jawgmaps.

The Bo01 housing exhibition was the first of several developments through which city planners developed new ways of encouraging sustainable buildings. With each neighbourhood of the Western Harbour, planners tested different dialogue processes and planning programmes. In 2002, the city government approved its first policy focused on sustainable buildings, a voluntary programme called *Ecologically Sustainable Construction in Malmö*. In the second phase of the Western Harbour, a neighbourhood called Flagghusen, planners followed the model of Bo01 by holding a dialogue with developers and negotiating an agreement that set sustainability targets beyond existing regulations. In 2009, the City of Malmö established a new model for sustainable construction that combined

dialogue, targets and local regulation. The *Environmental Construction Programme for Southern Sweden* specified three levels of targets for various aspects of construction, including energy and urban biodiversity, and required that developers meet the lowest level, which still exceeded national regulations. The city administration applied this new programme in the Western Harbour's third neighbourhood, called Fullriggaren, where construction started in 2010. The city's sustainability ambitions for this third neighbourhood also received financial support from a national government programme for sustainable cities.

Hyllie was the next city district to be developed after the Western Harbour. The city government's comprehensive plans had long pointed out Hyllie as the location for an urban centre in the south of the city, but the area was home to little but fields and a water tower until the early 2000s. Following the construction of the Öresund Bridge, which opened in 2000 and connected Malmö and Copenhagen by road and rail, the Swedish government decided to construct a railway tunnel under Malmö that would shorten the journey between the two cities. Plans for the tunnel included a station in Hyllie, which spurred plans for the city district. The first part of Hyllie to be developed was a commercial centre around the train station, which opened in 2010; an arena, a shopping mall, office buildings and a conference centre were completed between 2008 and 2012. Planning for the first residential neighbourhood began in 2007 and the first building was completed in 2013. As of 2015, the city administration planned that Hyllie would be home to 9000 apartments by 2040.

As plans for Hyllie progressed, city planners looked for ways to build on their experiences from the Western Harbour. They attempted to find funding from the European Union, discussing projects with other European cities but never succeeding in becoming more than an observer city. While these efforts took place, the city government also approved a new version of the Malmö Environmental Programme (MEP). The 2009 version set the ambitions that Malmö would become "Sweden's most climate-smart city" and that 100% of the city's energy needs would be provided by

renewable energy by 2030. It was in this context that city planners began discussions with Eon that led to the Climate Contract. According to Emil, a planner from the Environmental Department, the Climate Contract needed to show that the city government really meant to achieve the MEP's ambitions:

> The city government consolidated with the societal actor with responsibility for energy infrastructure and that's Eon. And the actor with responsibility for waste infrastructure and that's VA Syd. That's how I usually describe the reason for creating the Climate Contract. There are other perspectives of course. But what was important with the Climate Contract was credibility. To create credibility for the Malmö Environmental Programme and the direction that the programme points out. (Interview, 2015)

Discussions between the City of Malmö, Eon, and a municipally owned infrastructure company called VA Syd resulted in the signing of the Climate Contract in February 2011. The importance of Malmö's climate goals is clear from the first page, which begins by referencing the MEP, and goes on to explain that reaching the MEP's goals "require that Hyllie takes important steps and leads the development toward a sustainable city."[11] From Eon's side, Oscar explained that the company pushed for a holistic perspective on Hyllie's energy systems:

> There were a few aspects that we pushed for. One was to see the solutions in Hyllie from a holistic perspective. Not one solution for heating, one for electricity, and another for natural gas. We see the energy system as a whole. And we want to demonstrate how this energy system as a whole can be designed in the best way possible. With a link to other infrastructure too: waste, wastewater, transport, etc. That was very important to us. (Interview, 2015)

One effect of this perspective was that the Climate Contract counted not only renewable energy, but also recycled energy from incineration and the production of biogas. The smart grid was another example of Eon's influence.

Once the Climate Contract was signed, work began to achieve its goals. The signatories constituted three inter-organisational groups tasked with its implementation. The group described at the beginning of the chapter was the project group, which met monthly and consisted of employees from Eon, VA Syd and several city departments. There was also a steering group, consisting of mid-

[11] City of Malmö, Eon and VA Syd, 2002. *Climate Contract for Hyllie*, p. 2.

level managers from each organisation and department, as well as a commissioning group, made up of high-level bureaucrats and directors with the authority to make decisions about how to interpret the contract. The Climate Contract soon resulted in funding from the Swedish Energy Agency for a project called Smart Grids for Hyllie (officially *Smart Grids for a Sustainable Energy System in Hyllie*). The project operated from 2011 to 2016 and demonstrated smart grid technologies, but it also provided resources to work on the Climate Contract's goal of making Hyllie climate neutral. The next section of the chapter follows the challenges of finding renewable energy for Hyllie.

4. Renewable energy in the climate-smart city

To provide Hyllie with renewable and recycled energy did not seem so complicated in the beginning. The Climate Contract was clear in its ambition—100% by 2020—and Eon made commitments soon after they signed the Climate Contract. However, Eon's plan to build wind turbines within city limits led to several challenges. After several years, as it became clear that Eon's commitment would not give sufficient results, the project group was forced to investigate alternatives.

The very first step of making Hyllie climate neutral was to calculate the scale of the commitment. The Climate Contract stated that 100% of Hyllie's energy would come from renewable or recycled sources by 2020, but Hyllie's energy consumption in 2020 would depend on the number and types of buildings constructed by that time. The project group calculated an energy balance that matched estimated energy consumption for 2020 with the estimated production of energy from renewable and recycled sources. In terms of consumption, the Climate Contract clearly delineated Hyllie geographically with the help of a map. This map drew the boundaries of Hyllie with broad strokes, without any special consideration of parts of Hyllie that were already built before 2011; large facilities in the commercial centre had already opened, and there had been a small residential area in the south of Hyllie since many years. The energy consumption of these areas, as well as all new construction in Hyllie, was included in the energy balance.

Eon took the lead when it came to the production side of the energy balance. The Climate Contract specified that the energy for Hyllie should be produced within the Öresund region, which was defined as southern Sweden and eastern Denmark. The energy balance started with the recycled energy produced by incinerating and making biogas from waste produced in Hyllie. Eon then committed to converting one of its district heating plants to use biomass, providing enough annual heating capacity to cover all district heating use in Hyllie. It also proposed a plan for renewable electricity based on wind turbines, as Oscar explained during an interview:

> When it came to wind we stated our intention that we were prepared to build wind turbines. But we didn't own any land on which to build those turbines. There was a-- I think it was the city's comprehensive plan. Where they had located a bunch of potential locations for wind turbines within the city limits. (Interview, 2015)

This plan required the help of the city administration. The comprehensive plan showed potential locations for wind turbines, but the city would have to sell this land to Eon for the company to build wind turbines.

Eon's attempt to build wind turbines within city limits was an arduous and unfruitful endeavour. Even finding sites to allocate to Eon proved challenging. Emil, one of the Environmental Department's representatives at the project group meetings, explained that there were conflicts between the Property Department, which had the authority to sell land, and other city departments:

> We discussed where in the city there could be wind turbines. One suggestion was along the outer ring road. […] One area that we looked at was by the shopping centre and industrial area in the south of the city. […] South of there is countryside, land that the city owns. But the Property Department absolutely doesn't want to build wind turbines there. Because they think the land could be sold for development some day. And according to the prevailing logic at the Property Department, wind turbines are a threat to development. They decrease the value of neighbouring land. And since city council has given them the responsibility to earn as much as possible when they sell land, they don't want wind turbines there. (Interview, 2015)

In the end, Eon only received a single plot of land where it could build a only one wind turbine, but it ran into problems there too. Neighbours contested the company's plans and the County

Administrative Board overturned the wind turbine's building permit because of the location's cultural significance. Eon appealed the decision but over time gave up their plans.

Eventually, Eon and Malmö decided to look at alternative ways to realise the energy balance for Hyllie. As they debated alternatives in the autumn of 2015, the credibility of the Climate Contract remained important. For the city administration, it was something they used to motivate developers to build sustainable buildings; for the city administration and Eon together, it was part of the justification for their application to the Swedish Energy Agency for a follow-up project about smart city infrastructure. The project group debated whether it was reasonable to require that Hyllie's renewable energy come from within the Öresund region. If they could include production from other parts of Sweden, they could count wind power that the City of Malmö already purchased from northern Sweden; furthermore, they might be able to convince some of the large energy users in Hyllie to purchase wind power of their own. Eon also proposed to count two wind turbines that the company owned that were located in the Öresund region; the company had not built these turbines for Hyllie, but the turbines were constructed after the Climate Contract was signed. Notably, the project group did not place much attention on the consumption side of the energy balance. At one point, the steering group asked them to consider whether behaviour change could decrease energy consumption enough to influence the energy balance, but the project group did not dedicate any meeting time to this suggestion. But neither did they consider excluding the facilities built prior to the signing of the Climate Contract in 2011, because they believed that such a change would damage the contract's credibility.

The result of the debate was a change of perspective. At its meeting in November 2015, the Climate Contract's commissioning group decided formally to stick to its commitments. It accepted Eon's wind turbines, since they fit the contract's temporal and geographical delimitations, but did not accept wind turbines from northern Sweden. The result was an imbalance in the energy balance—

Hyllie would not be climate neutral by 2020. They justified this decision by stating that Climate Contract was a pilot project for the rest of Malmö. Even if the Climate Contract's signatories did not meet their goals, the commissioning group claimed that the lessons learned would help in the pursuit of the long-term climate goals for the rest of the city.

This decision did not end all efforts to meet the climate neutrality goal. As described at the beginning of the chapter, the project group continued to look for opportunities, and the City of Malmö sought meetings with the County Administrative Board to discuss where it would be possible to build wind turbines. But while the promise of renewable energy lost momentum, urban smart grids remained an area of success for the Climate Contract. The next section describes how Hyllie's smart grids became a contrast to its renewable energy ambitions.

5. Making buildings climate-smart

While smart grids ultimately became a part of Hyllie's success story, the Smart Grids for Hyllie project was not a slam dunk. The project aimed to demonstrate many different types of smart grid technology and depended on buildings that were not constructed at the time of the project application. Slow construction in Hyllie was a challenge. Still, by the end of the project, Eon had demonstrated new technologies, and the city administration had incorporated smart grids into a new planning programme for Hyllie.

The aim of the Smart Grids for Hyllie project was to demonstrate smart grid technologies in three contexts: in apartments, in buildings, and in energy distribution infrastructure. In apartments, the project tested displays to visualise energy use for tenants, technologies to automate the control of energy use, and other energy efficiency measures. In buildings, the focus was to develop a demand response controller: a small device that could be connected to the building management system and accept signals from Eon to curtail energy use. In energy distribution infrastructure, Eon developed a

district energy management system that could monitor energy flows and send signals to buildings, as well as technology to accommodate more renewable energy production in a district's electricity and heating networks.

The project was complicated by the slow pace of construction in Hyllie Avenue, the first residential neighbourhood in Hyllie. Eon had some initial success in influencing the Hyllie Avenue Sustainability Agreement. Signed by all developers in the neighbourhood, the agreement specified among other things that "the monitoring and control system [of each building] shall be able to communicate with Hyllie's common energy management system."[12] However, the slow pace of construction and a lack of interest from developers meant a single building with 54 apartments was the focus on most tests in the neighbourhood. Another residential building was included in the demand response tests, as were an office building and the arena.

Four years in, the project showed some successful results despite the lack of residential buildings in Hyllie. The results were not at the scale that the project originally intended; despite an initial project extension from three years to four, Eon did not manage to engage many developers. Still, the company had demonstrated that the demand response technology functioned as hoped. The manufacturers of building management systems cooperated in Eon's development efforts. Eon produced a demand response controller through which it could send signals to buildings. The company also reported to the Swedish Energy Agency that it could reduce a building's heat demand by 60% for five hours on a December day; the building's indoor air temperature decreased by less than half a degree, within the natural temperature variation. These results were promising enough for the Swedish Energy Agency to grant another project extension, which not only gave Eon another year, but also expanded the project's scope to include tests of demand response technology in other parts of the city.

[12] City of Malmö, 2012. *Hyllie Avenue Sustainability Agreement*, p. 4.

The city administration recognised the potential of smart grid technology in a new initiative called the Hyllie Environmental Programme (HEP). The HEP was a voluntary programme that the city administration released in 2015 as the fourth year of the Smart Grids for Hyllie project was coming to an end. The programme's stated purpose was to give developers an answer to the question of "How can my project become a part of Climate-Smart Hyllie?"[13] The HEP addressed this question by specifying 20 goals for each building in Hyllie, and for each goal it assigned tasks to the developer, to city departments, and to other stakeholders such as Eon. The city administration believed in smart grid technologies enough to include as one goal that "Hyllie's buildings and facilities are connected to Smart Grids."[14] This goal proposed that "The developer, together with Eon, identifies which installations (heating systems, cooling equipment, ventilation systems or other) are appropriate for connection to Smart Grids."[15] Should developers follow the HEP, they would involve the Eon in the design of their buildings, potentially giving additional attention to energy issues. While the programme was not mandatory for developers, the inclusion of smart grids provided Eon with more legitimacy for its smart grid technologies.

The fifth and final year of the Smart Grids for Hyllie project showed additional success for Eon. The extension allowed Eon to further test the demand response technology, which it had demonstrated in new buildings in Hyllie, in existing buildings in other parts of Malmö. It performed two tests. The company tested demand response in the district cooling network of the Western Harbour, where there were problems providing the capacity to cool office buildings on warm days. They also tested demand response in the district heating network in the southwest of the city, where bottlenecks in the distribution network sometimes required Eon use two district heating plants that ran on natural gas and oil. Both these tests were successful. In the final report for the Smart Grids for Hyllie project,

[13] City of Malmö, 2015. *Hyllie Environmental Programme*, p. 5.
[14] City of Malmö, 2015. *Hyllie Environmental Programme*, p. 11.
[15] City of Malmö, 2015. *Hyllie Environmental Programme*, p. 11.

Eon wrote that it could transfer the technology to other city districts and other cities; the impact on the district cooling network was enough that the technology could be used in existing operations.

In the end, the demonstration of smart grids in Hyllie was more successful than the construction of wind turbines. Like the search for renewable electricity, the demonstration of smart grids also ran into challenges. The slow pace of construction prevented Eon from testing demand response technology on the scale that it had hoped. However, Eon managed to overcome these challenges and produce some successful results within the Smart Grids for Hyllie project. The results were not only lessons learned for next time; there were new demand response technologies that the City of Malmö endorsed, and that Eon could spread to other cities. The Climate Contract gave Eon a chance to experiment in Hyllie and the company managed to make something out of it.

6. Conclusion

The Climate Contract was signed in 2011 and set goals for Hyllie in 2020. By 2016, as described in the beginning of the chapter, it was clear that Hyllie would not become climate neutral—a disappointment for the city government, which had the ambition to power the entire city with renewable energy. In contrast, as the Smart Grids for Hyllie project ended in 2016, Eon had demonstrated new technologies that it could start to apply in other city districts and even other cities. In terms of achieving their respective goals, it would appear that Eon got more out of the Climate Contract than the City of Malmö. This chapter set out to ask how a city government can go from sustainable to climate-smart without falling victim to a corporate takeover. Did Eon's participation allow the smart city to push the sustainable city out of the way? Did practitioners in Malmö let control slip into Eon's hands?

The struggle to build wind turbines shows that there were more factors at play. The plan for renewable energy reflected the city government's underlying challenge, being dependent on the

energy company to fulfil its objectives. But in the case of Hyllie, all signs show that Eon attempted to follow through on its promise to build wind turbines. The plan failed for other reasons, one of which was scepticism to wind turbines within another city department. The difficulty in constructing wind turbines in a city stems from their physical properties: they are large; they require land that could be used for other purposes; they are imposing structures that are not always appreciated by neighbours. The failure to build wind turbines near Hyllie occurred despite the combined resources of Eon and at least two departments of the city government. There was corporate influence, but it was in *support* of the Climate Contract, yet it was still not enough to achieve the Climate Contract's goal of a making Hyllie climate neutral by 2020. It was other factors that made it too difficult to achieve this goal.

The Smart Grids for Hyllie project provides an opportunity to examine the other three concerns about smart cities that were raised in the second section of this chapter. The project's main success story was the demand response system that could control energy loads in buildings. First, did the project result in an undue prioritisation of problems that could be solved by smart technologies? The demand response system does redefine energy efficiency in a sense, as it focuses on peak energy demand. In contrast, the City of Malmö's climate goals were defined in terms of total annual energy use. But it is hard to say whether such a redefinition is better or worse in terms of overall climate change mitigation. At any rate, Eon showed how the demand response system could reduce the need for fossil fuels in the district heating networks. Second, did the project result in increased surveillance? While the demand response system did involve monitoring of heating and cooling demand, the system monitored demand of the entire building rather than the individual apartment. This implementation avoids some of the 'big brother' concerns that accompany many smart city technologies, which often measure the behaviour of individuals in detail. Third, did the project result in buggy, brittle and hackable buildings? This question is more difficult to answer. The project did not report any problems related to the security or reliability of the demand response system. But

only time will tell whether the system is maintained sufficiently to avoid such problems in the future. Altogether, the demand system neither unequivocally supports nor discounts these three concerns.

There are nevertheless some reasons for to hold out hope for a shift from sustainable cities to climate-smart ones. At the very least, the story of Hyllie is not as dystopian as the image portrayed by those most critical of smart city ideas. A rather common narrative for smart cities is as follows: smart cities are an invention of multinational corporations such as IBM and Cisco who want to expand their businesses into urban governance; these companies push unnecessary technological solutions, lock in city governments, and secure profits while leaving societal problems unsolved. In the case of the Climate Contract, this narrative would be an unfair characterisation. The vision of a climate-smart city district in Hyllie was not simply pushed on the city government by a powerful corporation. When it came to the vision for Hyllie, Eon's fit its ambitions for urban smart grids within the city government's pre-existing vision of a climate-smart city. The democratically approved vision for the city, to be powered by renewable energy by 2030, remains in place.

Another reason to hold out hope for the climate-smart city is the slow progress made in the name of sustainable cities. Reducing energy use in buildings and increasing the share of renewable energy production are longstanding ambitions that have proved difficult for practitioners of sustainable urban planning. Energy efficiency measures, including concepts such as passive houses, are often resisted by property developers who consider them to be too expensive, or they are ignored by practitioners in the construction industry who are unwilling to deviate from routines. Similarly, the physical design of wind turbines makes them contentious in almost any setting, and constructing them in cities seems particularly challenging. In contrast, the demand response system that Eon developed seems to be less expensive and invasive, which could allow for greater adoption, especially if developers engage with Eon early in the design of their buildings, or if the technology is easy to integrate in existing buildings. While the demand response system might not have the same

climate mitigation impacts of passive houses or large-scale construction of wind turbines, it has potential to make a difference.

One of the most difficult aspects of such initiatives is perhaps how to deal with expectations. Only time will tell whether the results from Hyllie revolutionise urban energy systems—or make a small step in the right direction, if perhaps too slowly for the global climate. It might be unfair to expect a revolution, but one cannot be faulted getting one's hopes up after reading an ambitious vision like the Climate Contract. City governments make big promises in the hopes of building a coalition of energy utilities, developers and residents, and perhaps they must make such promises to receive funding from higher levels of government. But in doing so, they also set themselves up for disappointment. City governments establish visions and recruit coalitions precisely because they lack the resources and authority to act on their own; when the pursuit of the vision doesn't go as planned, city governments find themselves in a dilemma. They are left to hope that a coalition partner such as a multinational energy company will make up the difference. If not, the city government is left to explain how its failure is in fact a constructive learning experience.